

V. THE EASTERN AMERICAN OCCURRENCE OF
ATHYRIUM ALPESTRE

(Plates 161-168)

IN 1917 Dr. F. K. Butters pointed out¹ that the plants which had long passed in America as *Athyrium alpestre* (Hoppe) Rylands or as *Phegopteris alpestris* (Hoppe) Mett. differ from the Eurasian type and he called our plant *A. alpestre*, var. *americanum*; and a year later Maxon, emphasizing, besides the characters noted by Butters, some habital points of the plant of western North America, elevated it to specific rank as *A. americanum* (Butters) Maxon² and designated as the type (which Butters had neglected to do) a plant from the Selkirk Mountains. Still later, Christensen, who certainly knows the Eurasian plant, after discussing the Eurasian range of *A. alpestre* said: "In America the closely allied form *A. alpestre americanum* Butters."³ The treatments recently published give us, then, the choice of calling the American plant either *A. alpestre*, an endemic American variety, an endemic American species or a "closely allied form," and it is with the hope of throwing some clearing light upon the dilemma that the present notes and the accompanying photographs are presented.

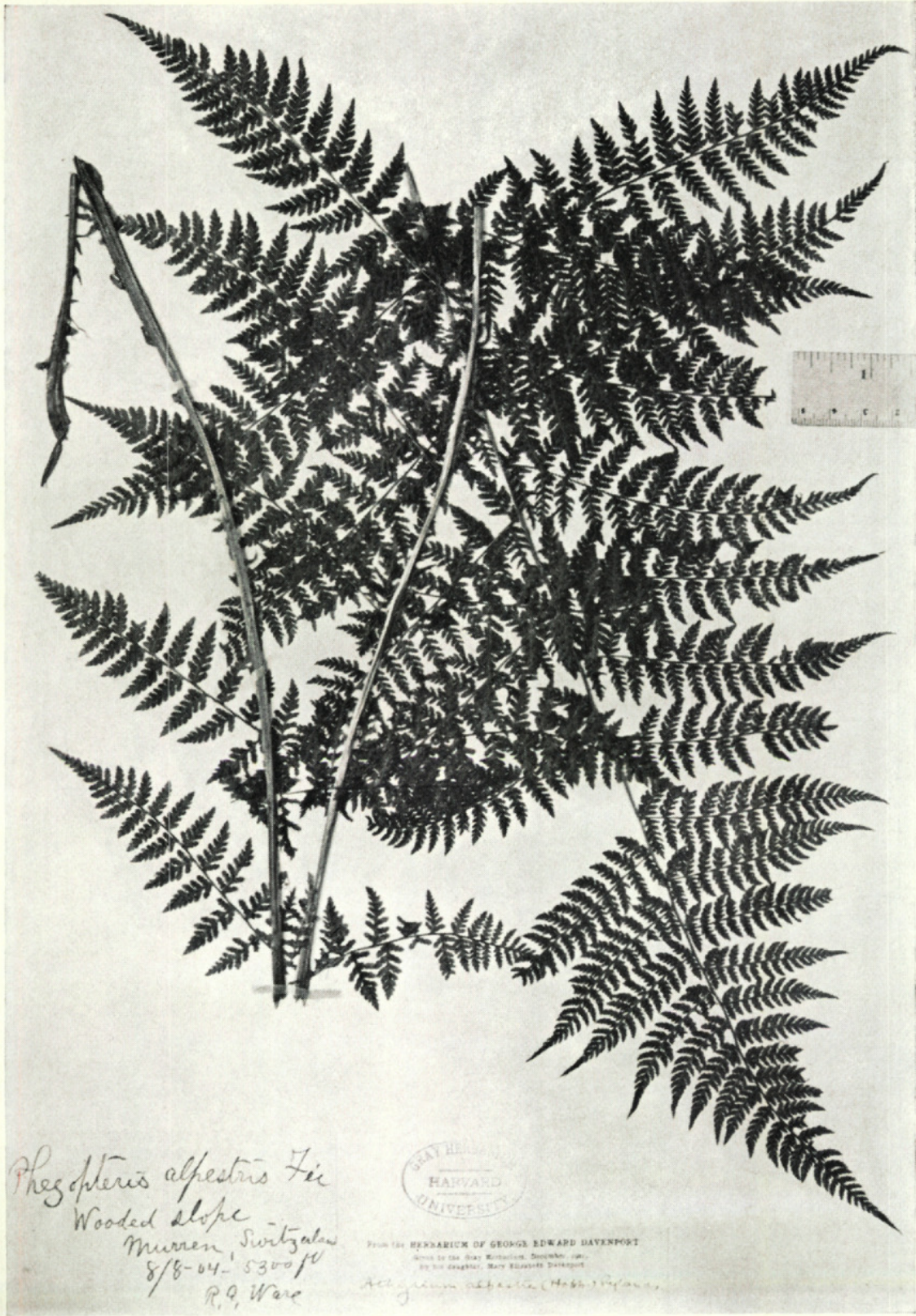
In eastern America *Athyrium alpestre* or its representatives are as yet known from only two regions: the gulches of Bard Harbor Hill, one of the Highlands of St. John, in northwestern Newfoundland, and the northern and northeastern slopes of the Table-top Range in Gaspé County, Quebec. On my four different visits to these areas I have during the first days studied the plants with enthusiasm and have put up, altogether, hundreds of sheets of specimens; but in each case, the plants soon proving to be abundant, my enthusiasm for them has gradually waned. The plant of Gaspé had been included by Butters and by Maxon with the cordilleran var. *americanum* or *A. americanum*; consequently, when the Newfoundland material was labeled it was assumed to be the same and it was later recorded⁴ without question as var. *americanum*. Comparison now shows, however, that the Newfoundland and Gaspé plants are not quite identical, nor are either of them satisfactorily placed with the cordilleran plant. The plant of Eurasia has decidedly "leafy" fronds,

¹ Butters, *RHODORA*, xix. 204 (1917).

² Maxon, *Am. Fern. Journ.* viii. 120 (1918).

³ C. Christens. in Hultén, *Fl. Kamtch. and Adj. Isl.* i. 40 (1927).

⁴ Fernald, *RHODORA*, xxviii. 117, 148 (1926).



ATHYRIUM ALPESTRE FROM SWITZERLAND, $\times \frac{1}{3}$



ATHYRIUM ALPESTRE FROM ICELAND, $\times \frac{1}{3}$



ATHYRIUM ALPESTRE, VAR. AMERICANUM FROM CALIFORNIA, $\times \frac{1}{3}$



ATHYRIUM ALPESTRE, VAR AMERICANUM FROM CALIFORNIA, $\times \frac{1}{3}$



ATHYRIUM ALPESTRE FROM NEWFOUNDLAND, $\times \frac{1}{3}$

ordinarily elliptic-lanceolate to ovate-lanceolate (pl. 161), one-fourth to one-half as broad as long, but in extreme specimens from open habitats (pl. 162) they are narrowly elliptic-oblong. Their larger pinnae are spreading or obliquely ascending, from oblong-lanceolate to narrowly deltoid and pinnatifid into broad-based oblong ultimate lobes; the sori are median and when well developed 0.75–1.4 mm. across and seemingly without any indusium. According to Butters, "Careful dissection shows, however, that the receptacle of the sorus is slightly elongated along the vein, and under a compound microscope it is almost always possible to find a vestigial indusium in the same position that the indusium holds in forms of *A. Filix-femina* with round sori. This indusium . . . often consists merely of two or three hairs joined together side by side at the base."

Athyrium alpestre, var. *americanum* Butters was described as having the segments of the fronds narrower and more distant than in the European plant, the ultimate ones linear; sori only 0.5–0.7 mm. across, submarginal and partly covered by the reflexed marginal teeth; vestigial indusium wanting. Butters added that, "As certain intermediate forms occur, it is the opinion of the author that this plant should be considered a distinct geographical variety rather than a species." Maxon, on the other hand, subsequently said "An examination of the very ample material in the National Herbarium, however, including some of the numbers cited by Butters as intermediate in leaf cutting, reveals no specimens which are truly intermediate in this or other respects . . . The American material is essentially uniform in all respects save size, and since it differs constantly from the European plant it should rank as a distinct species, ***Athyrium americanum***. The invariable absence of reduced indusia, which might be regarded as an inconsequential point if the plants were otherwise like the European, is a substantiating character of some worth; but disregarding this feature, the plant is different enough in gross characters to warrant separation. The conspicuously narrow, oblique, widely separated segments give it a strict, singularly skeleton-like aspect widely different from that of the leafy European plant, which has the segments spreading and more broadly attached; and the oblique, elongate-deltoid pinnae (with the basal pinnules often greatly produced) are equally at variance from the spreading, oblong-acuminate pinnae of the European species." Another character of the plant of northwestern North America not emphasized by Butters

nor by Maxon is the almost consistently linear-oblong to lance-oblong outline of the frond which certainly averages much narrower in proportion to its length than does the European frond. Reduced specimens of the European plant (pl. 162) have fronds very similar in outline to some of var. *americanum* (pl. 163) but well-developed European plants (pl. 161), have an elliptic- to ovate-lanceolate outline.

If the extreme plant of western North America (pl. 164) were alone to be considered, *Athyrium americanum* would upon some characters stand well apart; but when we take into account the Gaspé material, which both Butters and Maxon identify with *A. americanum*, and the Newfoundland material, the specific separation of the American from the European plant becomes more difficult. Such typical Newfoundland specimens as shown in pl. 165 and 166 (a small plant and a large frond from the same station) have essentially the outline, pinnae and degree of dissection of the two extremes of the European plant shown (pl. 161 and 162) and they also have the sori large and submedian as in the European plant. It does not seem possible, then, to separate them specifically or even varietally from the European material. It should be noted, furthermore, that their pinnae and those of the two European specimens illustrated are a bit more oblique than and quite as "elongate-deltoid" as in the type of *A. americanum* (pl. 167) specially selected by Maxon. Incidentally, one of the stated characters of *A. americanum* was that each sorus is "protected by a reflexed tooth of the pinnule." This character (which seems to be more ecological than morphological) is obvious in most American specimens but in some extra-American material (for instance Davidsson's Iceland plant, pl. 162) the teeth are even more vigorously reflexed than in the type of *A. americanum*; and many continental European specimens show some reflexing of the teeth. As a differential character it has no value.

The Gaspé plant (pl. 168) differs at once from the European and Newfoundland material seen in its tripinnate or, in large plants, almost quadripinnate fronds, with the ultimate strongly toothed segments linear or linear-lanceolate and remote; and its submarginal sori are only 0.3–0.8 mm. across. Its fronds have the elliptic-lanceolate to ovate-lanceolate outline of the European and Newfoundland plant, rather than the linear-oblong to narrowly lance-oblong outline of *A. americanum*. The Gaspé plant is, therefore,

intermediate between that of Europe and Newfoundland and that of the cordilleran region; the European and Newfoundland plant at one extreme, the cordilleran at the other extreme of a series.¹

Of the characters which have been ascribed to *Athyrium americanum* as distinctive the reputedly more oblique and elongate-deltoid pinnae are no more oblique nor deltoid in the type of *A. americanum* than in some characteristic specimens of the European plant, while the recurving of the marginal teeth is more conspicuous in some European specimens than in many of the American. The characteristically narrow outline of *A. americanum* appears in several sheets of European material, while the Gaspé plant, which both Butters and Maxon have considered identical with the cordilleran, has, when well developed, as broad an outline as the most extreme European plant. There remain to distinguish the continental American plants the narrower and more distant segments with smaller and mostly submarginal sori and the absence of the minute vestigial indusium which is often found, after sufficient search, in the European. But some specimens of the European plant before me have sori as small as in the American, the Gaspé plant has fronds as broad as in the broadest European, and at one of its stations (Southwest Gulch, *Fernald, Wiegand, Long, Gilbert & Hotchkiss*, no. 27,245) the fronds of the Newfoundland plant are unusually divided and thus make a strong approach to those of the Gaspé plant. In view of these facts I am forced to the conclusion, originally reached by Butters and recently subscribed to by Christensen, that *A. alpestre*, var. *americanum* is a geographic variety rather than a species; but that the plant of Gaspé is not var. *americanum*, but is a second variety standing morphologically as well as geographically midway between typical *A. alpestre* and its var. *americanum*.

These conclusions may be summarized in the following brief synopsis.

¹ This geographic phenomenon, the Newfoundland variant of a circumpolar series being nearer to the European than to the plant of continental eastern America, is frequent and I have specially noted it in the case of *Cypripedium parviflorum*, var. *planipetalum* Fern. RHODORA, xxviii. 168 (1926) and *Habenaria viridis*, var. *interjecta* Fern. l. c. 173 (1926). The *Cypripedium* of northern and western Newfoundland is so similar to the Eurasian species that, at the time of describing the Newfoundland plant, I suggested that *C. Calceolus* of Eurasia and *C. parviflorum* of continental North America might be extremes of one circumpolar type, with the Newfoundland plant bridging the morphological gap which separates them. Similarly, the northern Newfoundland (and northwest American) variety of *Habenaria viridis* is exactly intermediate between typical *H. viridis* of Europe and its var. *bracteata* of eastern North America. It is interesting, therefore, to add *Athyrium alpestre* to the species showing this European and Newfoundland relationship.

- Fronds bipinnate or somewhat tripinnatifid, elliptic-lanceolate to ovate-lanceolate (rarely lance-oblong), mostly one-fourth to one-half as broad as long; pinnules oblong-lanceolate, with the broad-based oblong ultimate lobes mostly approximate: sori median or submedian, the larger ones 0.75 to 1.4 mm. across. *A. alpestre*, var. *typicum*.
- Fronds tripinnatifid, tripinnate or nearly quadripinnate; ultimate segments of the pinnules linear or linear-lanceolate and distant: sori chiefly submarginal, mostly 0.3–0.8 mm. across.
- Fronds elliptic-lanceolate to ovate-lanceolate, from three-tenths to nearly one-half as broad as long, tripinnate to nearly quadripinnate. Var. *gaspensis*.
- Fronds linear-oblong to narrowly lance-oblong, from one-tenth to one-fourth as broad as long, tripinnatifid to tripinnate. Var. *americanum*.

ATHYRIUM ALPESTRE (Hoppe) Rylands, var. **typicum**. *Aspidium alpestre* Hoppe, Neue Taschenbuch, 216 (1805). *Pseudathyrium aspestre* (Hoppe) Newm. Phytologist, iv. 370 (1851). *Phegopteris alpestris* (Hoppe) Mett. Fil. Hort. Lips. 83 (1856). *Athyr. alpestre* (Hoppe) Rylands in Moore, Ferns Gr. Brit. and Irel. Nat. Print. fol. ed. t. 7 (1857).—Eurasia and northwestern Newfoundland. The following are from NEWFOUNDLAND: wet quartzite rocks and seepy banks along upper Deer Pond Brook, Highlands of St. John, July 28, 1925, *Fernald & Long*, no. 27,242; quartzite escarpment one-half mile south of Deer Pond, August 20, 1925, *Wiegand, Gilbert & Hotchkiss*, nos. 27,212, 27,243—see pl. 165 and 166; turfy and mossy quartzite rocks along Man's Humbug Brook, Highlands of St. John, August 21, 1925, *Fernald & Long*, no. 27,244; wet quartzite rocks and gravel along brook, Southwest Gulch, northeast of summit of Bard Harbor Hill, August 22, 1925, *Fernald, Wiegand, Long, Gilbert & Hotchkiss*, no. 27,245; these stations all at altitudes from 260–460 m. (850–1500 ft.), the specimens all distributed as var. *americanum* and so recorded by Fernald, RHODORA, xxviii. 117, 148 (1926).

Superficially *Athyrium alpestre*, var. *typicum* so strongly resembles *A. Filix-femina* (Willd.) Presl as readily to be mistaken for it; in fact, the two were both included by Linnaeus in his *Polypodium rhaeticum*. It is at once distinguished by its almost complete lack of an indusium (sometimes represented by a minute vestige), on which account the plant has found a place in *Polypodium* and *Phegopteris* and as a distinct genus, *Pseudathyrium*. Its fronds are firmer than in *A. Filix-femina*, almost coriaceous, and its spores are blackish and reticulated. Fronds of the European plant are shown in pl. 161 and 162, of the Newfoundland plant in pl. 165 and 166, the photographs most kindly made by Professor J. F. Collins.

Var. **gaspense**, n. var., frondibus elliptico-lanceolatis vel ovato-lanceolatis 2–7 dm. longis 0.7–2.5 dm. latis tripinnatis vel subquadri-

pinnatis, segmentis ultimis linearibus vel lineari-lanceolatis plerumque distantibus; soris 0.3–0.8 mm. diametro submarginalibus.—North-eastern region of the Table-top Range, Gaspé County, QUEBEC: crevices of granitic rock, altitude 750–1050 m., easterly and northerly slopes of Table-top Mountain, August 9, 1906, *Fernald & Collins*, no. 151 (small plants of exposed situation); forming extensive areas in alluvium of alpine brooks, easterly and northerly slopes of Table-top Mountain, August 9, 1906, *Fernald & Collins*, no. 151a (large plants up to 9 dm. high)—nos. 151 and 151a distributed as *Phegopteris alpestris* and cited by Butters as *A. alpestre*, var. *americanum*; alpine and subalpine meadows and brooksides at about 1100 m. alt., north-eastern slope of Mt. Dunraven, August 2, 1923, *Fernald, Dodge & Smith*, no. 25,384 (TYPE in Gray Herb.); brooksides and meadows at about 975 m. alt., above the cascades, head of Gorge of Northeast Branch of Rivière Ste. Anne des Monts, August 5, 1923, *Fernald, Dodge & Smith*, no. 25,385; subalpine meadows on eastern base (alt. about 900 m.) of Mt. Au Clair, August 10, 1923, *Fernald & Smith*, no. 25,386; nos. 25,384–25,386 distributed as var. *americanum*.

The type-specimen, photographed by Professor Collins, is illustrated in pl. 168.

Var. AMERICANUM Butters, RHODORA, xix. 204 (1917), excluding plant of Quebec. *A. americanum* (Butters) Maxon, Am. Fern. Journ. viii. 120 (1918), where a type-specimen is designated (*Heacock*, no. 554).—Alaska to Colorado, Nevada and California.

The type-specimen is illustrated in pl. 167; other specimens in pl. 163 and 164.

EXPLANATION OF PLATES 161 TO 168

(Photographs by J. F. Collins)

161, *ATHYRIUM ALPESTRE* from Switzerland; 162, from Iceland. 163, *A. ALPESTRE*, var. *AMERICANUM* from Tulare Co., California, *Culbertson*, no. 9538; 164, from Tuolumne Meadows, California, *Smiley*, no. 810. 165 and 166, *A. ALPESTRE* from Newfoundland, *Wiegand, Gilbert & Hotchkiss*, no. 27,243. 167, TYPE of *A. ALPESTRE*, var. *AMERICANUM*, from Selkirk Mts., British Columbia, *Heacock*, no. 554. 168, TYPE of *A. ALPESTRE*, var. *GASPENSE*, from Gaspé Co., Quebec, *Fernald, Dodge & Smith*, no. 25,384.

(To be continued.)

THE GRASS GENUS DIGITARIA

KENNETH K. MACKENZIE

IN the June 1927 number of RHODORA Dr. A. S. Hitchcock has an article concerning "The Validity of the Grass Genus Digitaria." This genus originated with Heister, and was successively taken up by various authors, namely by Fabricius in 1759, Adanson in 1763,



Fernald, Merritt Lyndon. 1928. "The eastern American occurrence of *Athyrium alpestre*." *Rhodora* 30, 44-49.

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